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Google Cranks Green Dial in Building Endless Server Farm

By [Robert McMillan](#)

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Urs Hölzle [R-L], Dean Garfield, and Steven Levy at Google Thursday. *Photo: Google/Daniel Gaines*

MOUNTAIN VIEW, CALIFORNIA — Google opened its first data center in The Dalles, Oregon, seven years ago. Since then, the company has spent billions rolling out new state-of-the-art server farms on four continents. It's been an incredible building binge, and the company has no idea when it's going to stop.

According to the guy who's been in charge of Google's servers for nearly 15 years now, the company has five-year data projections about how much capacity it will need, but he doesn't put much stock in them. "We don't believe our own numbers. The error bar is just too high," says Urs Hölzle, Google's Senior Vice President for Technical Infrastructure. "Five years ago, you basically didn't have an iPhone, you didn't have app markets. YouTube was much smaller. Facebook basically didn't exist... It was just a radically different world. So who am I to say that I can know how the world five years from now is going to be radically different? I kind of know it is going to be, but I can't tell you which ways."

But that cloudy future doesn't have Hölzle worried. Servers and smartphones have a symbiotic relationship. Faster processors, cheaper memory, and new power saving techniques may be pushing people to use more of Google's services, but they're also boosting the servers in Hölzle's data centers. "These same technology trends that make it cheaper for you to consume more bandwidth are also the ones that make it cheaper to serve that bandwidth or that storage or that computation," he says.

Google would like to host as much of the world's data as it possibly can. It wants your email, your documents, your videos, and your photos too. But as the work of processing this data has moved into big data centers, they've [come under scrutiny](#). Are they marvels of technological efficiency? Are they power hogs?

The truth is, they're a bit of both. Over the past decade, companies like Google, Amazon, and Facebook have done a lot to make sure that most of the power that they use goes toward running

servers. They've cut back on power-hungry air conditioning systems by redesigning the air flow in their data centers and allowing them to run much hotter than they once did.

Most of corporate America runs its servers at about 10 percent utilization, according to a McKinsey estimate. Google is much more efficient than that, but even so, it's proving to be hard to keep all servers busy at all times. Google's servers use between 30 percent and 80 percent of their compute resources, depending on what kind of job they're doing, Hölzle says. The company's web crawlers and indexing servers can keep pretty busy, but Gmail servers slow down at night when people are sleeping. "If you do Gmail, well, during the day, people send more email than at night," he says.

"Realistically, you can't get above 50 percent average utilization," Hölzle adds.

Right now, the industry is only starting to talk about how server utilization should be measured and [what that even means](#). In March, [eBay went public with a wealth of information](#) about its own data center power use and efficiency, but Google has been more tight-lipped. The company won't even say how many servers it operates.

But Google has fostered a remarkable effort to change the way its data centers are powered. The company has cut deals with utilities to ensure that its power is comes from renewable sources like wind and solar farms. On Thursday, Google invited representatives from a wide range of technology companies, including Microsoft, HP, and Intel, to its campus to discuss the role of the internet on the environment (it kicked off with former Vice President Al Gore lecturing attendees: "data centers now waste up to 90 percent of the energy they use," he said).

But according to Hölzle, the bigger energy problems have to do with the efficiency of desktops, routers, and mobile devices and the amount of energy — and the type of energy — used to build and power them. Right now about a third of Google's data center power comes from renewable sources like wind or solar. Eventually, that will be 100 percent, he says. The data center power problem is "sort of the easiest part to solve, because it's concentrated and we've been working on it for a long time," he says. "The rest of the internet is still pretty big."

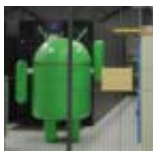
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Robert McMillan is a writer with Wired Enterprise. Got a tip? Send him an email at: [robert_mcmillan \[at\] wired.com](mailto:robert_mcmillan@wired.com).

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